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ABSTRACT

Problems and opportunities posed for liberal arts colleges by the current political concern for educating students for high technology industries are considered. Recent reports on education, high technology, employment, and economic growth are concerned with the competitive position of the United States versus other industrialized nations, especially Japan. These reports also suggest the need to develop scientific and technological leadership, as well as a technically sophisticated work force capable of producing new products. Attracting students into science and engineering fields, setting higher standards in these disciplines, and building close university-industry relations have also been emphasized. It is claimed that the educational basis for economic prosperity in the future will still depend on analytical skills, creativity, communication skills, a knowledge of major social institutions, and sensitivity to ethical issues. The following suggestions are offered: (1) more serious attention should be paid to defining "scientific and technological literacy" and then giving it a central place in the curriculum; and (2) effort should be directed to prepare students for a world of international dependence and to be perceptive citizens of large social, economic, and political institutions. A list of associations of private colleges is appended. (SW)

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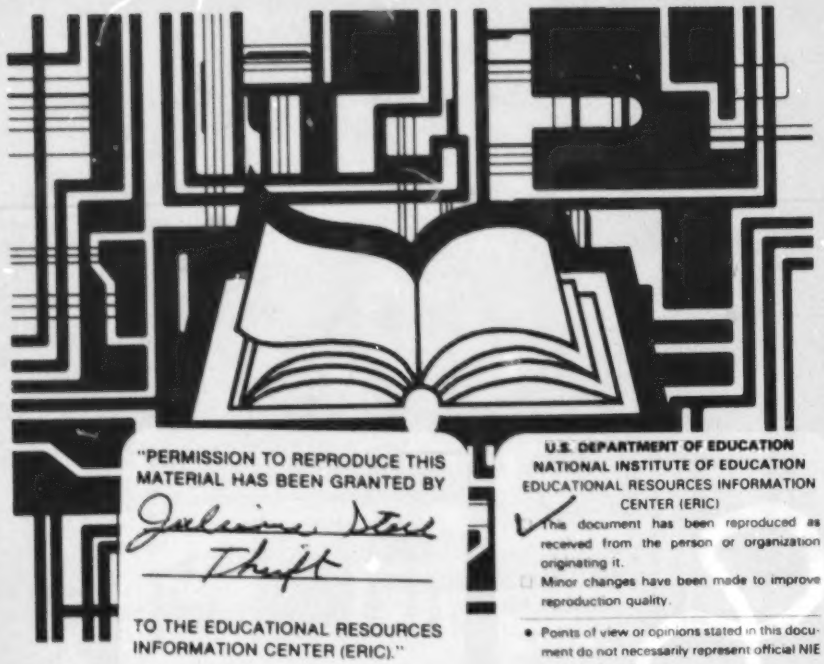

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"Winning Technologies" and the Liberal Arts College

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Published by
The State Association Executives Council

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Introduction

State associations of independent colleges and universities work to assure that policy makers, business leaders, and the general citizenry recognize and support the contributions of the independent sector of higher education to the public good.

The recent emphasis on "high technology" has prompted a number of concerns among association executives. Too often the rush to jump on the high technology bandwagon has caused state funds to be appropriated without consideration of the multitude of elements that are important to the economic development within the states. And, the stress on the technical has cast doubt, in some minds, on the value of liberal learning.

In answering these concerns, the State Association Executives Council (SAEC) commissioned Dr. Stephen S. Weiner to address its 1983 summer meeting on the subject of liberal arts and high technology. His remarks were so well received that SAEC decided to publish them. The intended audience for this paper is college and university presidents, trustees and other officials; business executives; and state and federal policy makers. We believe his paper will bring new understanding of the vital role of the liberal arts.

Robert Kelly, *SAEC Chairman*
Morgan Odell, *SAEC Vice Chairman*

STEPHEN S. WEINER received his Bachelor and Master of Science degrees from the College of Engineering at the University of California, Los Angeles. He has served as administrative assistant to a member of Congress; special assistant to the National Advisory Commission on Civil Disorder; education consultant to the Rand Corporation; and vice president of a venture capital company. After receiving his Ph.D. at Stanford, he was a member of the faculty in the Stanford School of Education. In recent years he has served as Associate Dean of the Graduate School of Public Policy and Acting Dean of the School of Education at the University of California, Berkeley, and Special Assistant to the Vice President of the University of California. He has also been President of the Board of Governors of the California Community Colleges and is now a member of the California Student Aid Commission. He is currently Provost and Dean of Faculty at Mills College, Oakland, California.

The four horsemen

Conscientious leaders of liberal arts colleges have spent much of the last decade reading apocalyptic accounts of their future. While not nearly as terrifying as the four biblical horsemen of the apocalypse (famine, conquest, pestilence, and war), there are an equal number of reputed threats to liberal arts colleges. The first horseman who now endangers the liberal arts college is Demography and the consequent shrinking pool of people of traditional college-going age. Threats to enrollment and revenue follow in its path. The second threat is Preparation and the associated deterioration in the ability of entering students to write and to engage in various forms of reasoning and analysis. The third evil horseman is Recession and its erosion of the capacity of students and their families to pay the ever-rising tuition and fees at independent institutions. The fourth horseman is High Technology, who, in combination with Recession, is beckoning students to the dreaded land of Vocationalism and is poised to cut the ties of affection between public officials and liberal arts colleges on grounds that liberal arts graduates are ineffective warriors in the new international economic competition. This paper addresses the problems and opportunities posed for liberal arts colleges by that fourth horseman.

Some of my colleagues at liberal arts colleges are either seized by fear at the appearance of High Technology or vainly proclaim that our colleges should not be judged on the basis of contributions to solving the economic problems of American society. I dissent from both points of view.

The patrons and supporters of liberal arts colleges have every right to expect our institutions to help strengthen the economic position of the United States. Indeed, I shall argue that liberal arts colleges already make a strong contribution in this regard and could do more. However, I object most strenuously to the narrow and ill-considered assertions about high technology, economic development and education that now dominate political discussion at every level, federal, state and local. Let me try to put the political passion for high technology and the appropriate response of liberal arts colleges into perspective.

Flotilla of reports

It is the era of the Report. The subject of the Report is High Technology, Economic Growth, Jobs, Education and the American Future (or any subset of the foregoing linked either to a national commission or the name of a particular state). The sponsoring groups include the National Science Foundation's Commission on Precollege Education in Mathematics, Science and Technology; the Commission on Higher Education and the Economy of the New England Board of Higher Education; the Western Technical Manpower Council of the Western Interstate Commission on Higher Education; the Task Force on Education for Economic Growth of the Education Commission of the States; the California Commission on Industrial Innovation; the Committee on Higher Education and Economic Development of the Illinois Board of Higher Education; and the list goes on.

Next to the new bookcase where these reports are displayed is a filing cabinet used to store the reports that focus more exclusively on education from the National Commission on Excellence in Education, the Twentieth Century Fund, the Committee for Economic Development, the U. S. Chamber of Commerce and a host of other panels, task forces, commissions, committees and boards. Simply to lift these Reports is an impressive feat, much less to read them. The members of these study groups include governors, legislators, civic leaders, college and university presidents, scientists, and other educators and business leaders. If you have not been invited to serve on at least one of these groups, then you are not a member of the Educational and Industrial Complex.

Read individually, there is much that is sensible and useful in these documents. However, when one attempts to digest several of them, to the accompaniment of media coverage, a pernicious message results: America's economic and social problems are, at root, a consequence of our inability to beat foreign competitors senseless by means of triumphant science and technology. Therefore, our schools, colleges and corporations had better get busy processing all of our young people through tough courses in mathematics, science and computers. In short, this flotilla of reports, along with the editorials and political initiatives that churn in their wake, promises a technological solution for our sluggish Gross National Product, our long unemployment lines and our sagging national spirit.

Four basic tenets

Until I stopped to think about the cumulative effect of these reports, I was more than willing to join in the generally positive reaction of my fellow educators who typically say: "It is true that the current 'hype' about high technology is somewhat overdone. However, the wave of concern about foreign industrial competition is the first thing to come along since Sputnik and LBJ's Great Society that truly galvanizes political support for education. If this be panic, then let us make the most of it."

Pause for a moment to consider this view more carefully. The reports are not all cut from the same pattern. (Illinois' Committee on Higher Education and Economic Development settles for eight broad recommendations to its audience while the Western Technical Manpower Council fires off 53 recommendations for postsecondary education alone.) But all are fundamentally concerned with improving the competitive position of the United States versus other industrialized nations, especially Japan. Moreover, the reports approach unanimity on the following points:

1. The future welfare of the United States depends on securing an advantage over other nations in science and technology. In turn, scientific and technological leadership requires that the United States develop the finest corps of scientists and engineers in the world. (Although the language is muted, reports prepared at the state and regional level leave no doubt that the advantage must be held by the given state and region as opposed to other sections of the United States.)

2. The United States must have not only the best scientists and engineers, but also a technically sophisticated work force capable of producing new products. Therefore, the educational challenge is not only to direct our best minds into science and technology but also to train every high school student as if he or she is to become an engineer. For example, the report of the Conference on Education and Economic Growth, convened in February 1983 by the Carnegie Corporation and the Governor of North Carolina, contains this grim warning to parents and students:

> This high-technology revolution has profound socio-cultural implications. We need only look into the future a very short distance to see that the revolution will be whirling a great number of people out of its vortex. These are people who will be inadequately prepared to work —and to live—in a technology-based society. The principal social institution charged with addressing this problem is the educational system, in all its diversity.[1]

[1] Summary of the Conference on Education and Economic Growth, February 2, 1983, p. 1.

Parents who failed to enroll their children in a computer camp this summer can only read this quotation with a profound sense of guilt.

3. We cannot be content with new scientific and technological developments in fields such as biotechnology, robotics and computers unless they are rapidly turned into products that give the United States an advantage in the international marketplace. Therefore, research universities should not only invest time, talent and money to produce these new breakthroughs but they should also develop close and intimate relations with business and industry. In turn, corporations should make financial contributions to universities and ensure that university scientists have access to their colleagues in industry. Further, universities and industry should cooperate in attracting more and better students to science and engineering and in financing their education through the graduate level.

4. Since nothing less than national survival is at stake, government at every level should set higher standards for student performance in mathematics, science and computers and should provide financial incentives for university-industry cooperation. Investment in upgrading instruction should be targeted on mathematics and science even though the importance of other fields should not be forgotten.

These are the four basic tenets of the "High Technology Strategy" or what California's former governor, Jerry Brown, called "Winning Technologies." The political appeal of these arguments is enormous. My former staff colleagues on Capitol Hill would say that this issue has "sex appeal." "Winning Technologies" is the basis for differential salaries for math and science teachers, loan forgiveness programs for future engineers, tax breaks for companies donating computers to the schools, and a new High Technology Morrill Act modeled on the 1862 legislation that created the land-grant colleges. Even President Reagan is attracted by these ideas into a flirtation with "Atari Democrats."[2]

Questions to ponder

After hearing the high technology sermon, we might wish to ask a few questions:

A. To what extent is our current economic malaise a result of a lagging scientific and technological effort in the United States? Should we also weigh the consequences of federal tax and budget priorities (including those for military spending), of government regulations and high labor costs, of short-sighted energy policies, as well as organizational inertia and smugness within the ranks of business and labor leaders? For example, how much of the decline in the American auto and steel industries can be explained away by pointing to a lack of brilliant scientists and engineers within the United States?

[2]Business Week, March 28, 1983, p. 94.

B. Given the fact that industrial support provides no more than an average of 5% of sponsored research at research universities in the United States, how much support for education can realistically be expected from business and industry? How close can we build university-industry relations without compromising the free flow of scientific and technical knowledge within the academic and scholarly community? How far into the ranks of the entrepreneurs should we tempt faculty members and still expect them to discharge their obligations to students and their institutions? Further, what will be gained by spreading substantial financial support from government for scientific research well beyond the core of high quality research universities that have accounted for an overwhelming proportion of past scientific breakthroughs? At what point do "high technology" government programs simply become another form of the familiar political pork barrel?

C. What are our objectives in requiring additional mathematics and science instruction for all high school students? For example, why do we continue to emphasize high school instruction in trigonometry, or even geometry, when knowledge of probability and statistics is more useful to a variety of adult roles? Is it true that there are good jobs awaiting all students who have completed more math and science courses or who have pursued "high technology" vocational-technical curricula at the secondary and/or postsecondary levels?

D. Can additional government support for math, science and computers be arranged without damaging instruction in other subject fields? To what extent should educators encourage financial support for students in now fashionable fields? For example, if graduate student aid tied to science and technology is a good idea, then why shouldn't we take federal grants away from students in the fine arts in order to produce more engineers?

I do not know the answers to most of these questions but they are worth pondering before, as educators, we embrace "winning technologies" as our best hope for increased government support for education.

We do have data on future job opportunities. Henry Levin and Russell Rumberger of Stanford University, working on data from the United States Bureau of Labor Statistics, conclude the following:

> The total number of new jobs generated in . . . high technology occupations will be vastly outweighed by employment growth in other areas . . . the five occupations expected to produce the most new jobs (between 1978 and 1990) are all in low-skilled areas: janitors, nurses' aides, sales clerks, cashiers, and waiters and waitresses . . . In summary, government estimates suggest that employment growth

> will favor jobs that require little or no training beyond the high school level. Although employment in high technology occupations will increase quickly in percentage terms over this decade, the contribution of these jobs to total employment growth will be quite small.[3]

Also drawing upon data from the Bureau of Labor Statistics, Amitai Etzioni observes:

> There are going to be 600,000 new secretaries and 50,000 more people working on computers (in the next ten years). These are the relevant figures to somebody who plans his or her or other peoples' careers... once you have a well-trained secretary, it takes a week to make the work move from the Exxon typewriter to the IBM word displayer... It doesn't require that you restructure your life.[4]

There is a danger that I have painted the authors of the recent spate of reports in too dark a hue. I am sure that many of them would rally behind the banner of liberal education, only wishing that math, science and computers be added to the school curriculum at earlier stages and in greater measure. My quarrel, again, is not with individual reports but with the educational and political imperatives that take shape out of a large barrage of such documents and the accompanying, and necessarily simplistic, coverage by the media. The unfortunate net result seems to be a claim that America's problems are technological, not ones of human spirit, human relations and human organization. By contrast, I quote approvingly from David Hamburg, the President of the Carnegie Corporation, who wisely told the Conference on Education and Economic Growth:

> ... scientific progress does not guarantee human progress: the great leaps in knowledge in the physical sciences that have made possible our new information and communications technology have also produced nuclear weapons. We have to learn how—and to teach others how—to anticipate and handle the "side effects" that new technologies inevitably bring... Another (challenge) is fostering "soft attributes" that are highly pertinent to an effective economy, such as entrepreneurial skills, competence in communicating across multidisciplinary barriers, or understanding how to work within bureaucratic structures.[5]

Liberal arts challenge

Let me now turn to the liberal arts college, a neighborhood within the higher education community where I have recently moved after ten years of association with major research universities.

[3] "The Educational Implications of High Technology," Institute for Research on Educational Finance and Governance, Stanford University, February 1983, pp. 4-6.

[4] Bulletin of the American Association for Higher Education, Volume 35, number 10, June 1983, pp. 9-10.

[5] Op. Cit., pp. 5 and 7.

Put simply, liberal arts colleges are on the defensive. For many independent liberal arts college presidents, the hoofbeats of Demography, Preparation, Recession and High Technology are most distinct and deeply disturbing. Certainly public colleges face many of the same threats. Yet there is reason to believe that legislators will come more readily to the defense of public colleges faced with extinction than to the defense of private ones. Not surprisingly, large research universities have shown greater agility in turning "Winning Technologies" to their advantage than have small liberal arts colleges. Moreover, many liberal arts college presidents, by virtue of their own disciplinary backgrounds, consider themselves to be uneducated on matters of science and technology and their level of fear of the fourth horseman is understandably higher than for their presidential colleagues trained in the sciences.

Liberal arts college presidents have heard their students express grave anxiety about finding jobs upon graduation and they have talked to their admissions staffs who report that many prospective students and their parents fear that a liberal arts education is a ticket to occupational oblivion. The response of liberal arts colleges has often been one of defensiveness of two quite different varieties.

The first has been to mimic the most popular majors in research universities or vocational-technical institutes. "Oh, yes," these individuals proclaim, "you can attend our College and prepare to be a corporation executive, engineer or computer programmer just as if you were attending Big State University."

The second response, more typical of long-established, high-prestige and well-endowed colleges, has been to dismiss career concerns as simply another sign of creeping barbarianism: "The liberal arts curriculum is divinely inspired and should bear no relation to the problems of the surrounding society. At Cloister College, we learn simply for the sake of learning without a moment's thought about what comes after."

These responses have two things in common: both reflect misunderstanding of the history of the liberal arts and they display an insensitivity to the societal changes that higher education, and in particular liberal arts colleges, should now address.

There is nothing illegitimate about the career interests of our students. The nature of one's job is a major source of personal identification in adult life. We need to help our students better see the connection between the education we provide and the lives they will lead after graduation. The challenge before the liberal arts colleges is not only to better explain our virtues but also to better realize our potential.

Educating for change

Liberal arts education has from its inception been centrally concerned about the requisites of building and maintaining a civilized human community. Whether the context is ancient Athens, 18th-century England or the United States in latter decades of the 20th century, liberal arts education adheres to a conception of its role in preparing people for civilized life.

The genius of liberal arts education does not lie only in a particular conception of the curriculum or "general education requirements" but, as importantly, in the supportive, yet demanding, relationship that exists among students and teachers in the distinctive and intense environment that is the hallmark of every liberal arts college worthy of the name. Encounters between students and faculty in the liberal arts college draw the student into a range of study and an examination of personal values that is almost always unparalleled in the student's prior experience. The result is a degree of maturation and personal growth that ordinarily cannot be matched by study in larger and more impersonal institutions.

But what have these noble traditions and fine sentiments to do with the major economic issues that confront our society?

For me, the connection can be summarized as follows: the productive capacity of the United States depends centrally upon our collective ability to understand and manage the technological, international, and institutional changes that are upon us. To meet these challenges, the bulk of our students must have a college education that prepares them to deal with human dilemmas that arise from the technological, international and institutional forces that are the key variables in our economic equation. In meeting this need, liberal arts colleges, because of their size and traditions, have a comparative advantage over other postsecondary institutions.

Let me dwell for a moment on the three key changes.

First, lest my skeptical comments about "Winning Technologies" indicate otherwise, our world is increasingly and irreversibly scientific and technological. To quote David Saxon, a physicist who is now Chairman of the Corporation at the Massachusetts Institute of Technology:

> (Our society's) technological character means that everyone needs to know something about the nature and limits of science. It also means that we must give our scientists and engineers a knowledge of human history and values, and an understanding and appreciation of values other than those inherent in a purely technological perspective.[6]

[6] "On the Idea and the Ideal of Liberal Education," address by David S. Saxon, University of Florida Fall Commencement, December 18, 1982.

The record of our colleges and universities in this respect is nothing short of dreadful. The primary reason for our failure is that so few faculty members have successfully straddled the chasm that exists between the study of science and technology, on the one hand, and engagement in the humanities, fine arts and social sciences, on the other hand. As this chasm is bridged in the future, I expect that a disproportionate share of the exciting work and creative instruction will occur in the liberal arts colleges where the grip of the disciplines is modulated and the emphasis upon teaching is strong.

The second variable in the economic equation is the increasingly international character of our daily lives. The vigor of our economy and the prospects for peace are ever more entwined with the capacity of the United States and its citizens to understand other nations and cultures and to identify those matters where cooperation, rather than conflict, can dominate our relations with other societies.

But the significance of the international dimension of our lives, and the impact of technolgy, cannot be understood apart from the third variable: the rise of the major economic and political organizations that determine how we work, how we communicate, what we eat, how our health is maintained or undermined and the rules that we must obey. We live not only in an age of technology and global interdependence but also of bureaucracy. How we cope with technology, global interdependence and bureaucracy will determine as much of our future as will the products of our laboratories. But can one make the case that liberal arts colleges have a comparative advantage in addressing these issues?

At this point should come the obligatory exhortation on behalf of critical thinking skills, the ability to communicate and "learning how to learn." There is some discomfort associated with making this exhortation because we lack a precise measure of this quality in our students. But there should be little doubt on anyone's part that an education that fails to speak to our history, to the nature of our social, political and economic structures, to our values and our aspirations, be they expressed in philosophy or the arts, is a very superficial preparation for either economic productivity or personal fulfillment.

Moreover, we need to remind students, parents, policy-makers and ourselves that, in the words of Levin and Rumberger:

> . . . the general educational requirements for creating good citizens and productive workers are not likely to be altered significantly by high technology. Everyone should acquire strong analytic, expressive, communicative, and computational skills as well as extensive knowledge of political, economic, social and cultural institutions.[7]

[7]Op. Cit., pp. 11-12.

These are standard claims for a liberal arts education and they are as well accomplished at our institutions as at research universities and better than at vocational and technical schools.

Equally important, however, I think it essential that students emerge from their college years with a sense that they are part of a human community and that such membership implies both pleasures and obligations. I think it essential that students not only have a grasp of the learning process but also of the teaching process because leadership in our world is increasingly an act of enlightening rather than commanding others. And I think it essential that students emerge from college with a sense of self-confidence and personal worth if they are to cope with the many reasons that life presents for paralysis and inaction. I deem these matters essential because they are at the core of our collective capacity both to maintain and build a civilized community and to develop the individual capacity of our graduates to fill the productive adult roles that such a comunity entails.

It is in these latter respects that liberal arts colleges have their comparative advantage. Russ Edgerton, President of the American Association of Higher Education, a source less subject to institutional bias than I am, makes the point very well:

> Self-confidence, efficacy, and risk-taking develop as students participate in effective, working communities and engage in task-oriented activities. In some smaller, residential colleges and in experiential learning programs, I suspect these things still happen. But I doubt they happen often to students drifting from class to class in a university of 40,000. Sadly, the trends in recent years have been toward reducing the sense of engagement and involvement of students with their faculties and institutions.[8]

A crucial juncture

Several opportunities reveal themselves for leaders of liberal arts colleges in a time of high political priority on high technology and economic growth:

1. It is time to talk sense about the role of education in economic development and to substitute sound analysis for buzz words. No persuasive case has been made that the educational basis for economic prosperity in the future will be fundamentally different than in the past. Analytic skills, creativity, the ability to communicate with other human beings, self-confidence, sensitivity to ethical issues, and a knowledge of major social institutions continue to be the major elements needed to prepare students for life and work. Liberal arts colleges can and should point to their highly successful record in each of these respects.

[8] Bulletin of AAHE, June 1983, p. 6.

The nation's major continuing failure in the development of human resources continues to be the serious underutilization of talented women and minorities. In this respect, liberal arts colleges have served equal educational opportunities as well or better than other baccalaureate-degree institutions.

Students majoring in many different fields, including science and technology, are essential to the productivity of our economy. Once again, liberal arts colleges, because of their long traditions of excellent teaching, deserve support in equal measure as compared with other post-secondary institutions. Indeed, in a number of scientific fields, including computer science, there is every reason to believe that undergraduates receive more effective instruction and individual help from faculty in liberal arts colleges than in other institutions.

Liberal arts college presidents, in cooperation with their state associations of independent colleges, should take the lead in organizing forums for the discussion of the link between quality education and economic growth. Faculty, trustees, and alumni leaders should play a major part in these discussions.

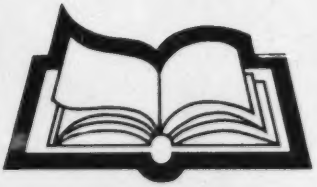
2. The most serious educational problems continue to be found at the elementary and secondary school levels. Leaders of liberal arts colleges should step forward as advocates of careful reform at the precollegiate level. If we meet this responsibility, then it will be quite clear that our contribution to debates over educational policy are motivated by a genuine concern about the health of the total educational system, public and independent, and not by blind self-interest. In joining the debate over school reform, leaders of liberal arts colleges have a special responsibility to speak out for the upgrading of the teaching profession. Without effective and dedicated teachers in the classrooms, tougher graduation requirements, longer school days, more discipline and better textbooks will have little salutary effect. The historic role of the liberal arts colleges as teacher-training institutions of high quality deserves attention and support.

3. Our society changes and new adaptations in liberal arts education must follow. In this paper, I have suggested that new and more serious attention be paid to defining "scientific and technological literacy" and then giving it a central place in the curriculum; to organizing much more ambitious efforts to prepare students to live in a world of cultural variety and international dependence; and to laying the groundwork for our graduates to become more imaginative and perceptive citizens of large social, economic and political institutions.

Beyond these new undertakings, each liberal arts college should be able to state, with greater precision than in the past, the instructional results of our baccalaureate programs. Do our students demonstrate skill in written English before graduation? Do we insist upon demonstrated facility in public speaking? Can our graduates point to first-hand experience in conducting empirical investigations? Can we claim that our students develop a detailed understanding of a major period in human history? And how do we know that our graduates have met these and other expectations? These are reasonable questions and a vague reference to the liberal arts tradition constitutes an insufficient answer.

We can enable, indeed require, our students to develop specific skills without compromising the integrity of the liberal arts. The teaching of skills not only makes our graduates more employable, but also provides a useful focus for our educational programs.

We are at a crucial juncture in the development of liberal arts colleges in the United States. Can we complement our historic strengths in ways that connect with the major economic and social changes that are shaping our society or will we fall victim to a lack of imagination? The American liberal arts college will be a stronger and more vibrant set of institutions at the end of this century if we choose our challenges wisely and work at them with persistent enthusiasm. As institutions, we must now demonstrate the analytic power, self-confidence and initiative that have, for so long, characterized our graduates.



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